ANALYSES OF APPLICABILITY OF UNIVERSAL (UNIFIED) LANGUAGES FOR MODELLING DOMAINS (p. 4-10)

Vitaly Mezhuyev, Tatiana Bondenko

The article is dedicated advantages and disadvantages of using a universal approach to modeling domains, as well as suggest ways to overcome these disadvantages, developed information technology domain-specific mathematical modeling, which provides an introduction to the modeling language UML structured goal models, sets, mathematical operations and combining grammars subject – oriented language grammar for the new Turing programming languages.

Among the advantages are highlighted: the fullness of description Pro expandability, commonality, conformity with best programming methodology, ease of graphical notation, independent of implementation tools, community support. Among the shortcomings highlighted: many dialects, commonality, congestion language, the complexity of concepts, lack of formalization and orthogonal concepts, imprecise semantics, user restrictions, the complexity of connections with language development, the complexity of the extensions, the problems in the study and implementation of, the inability to change the modeling process, the efficiency of the code. Among the ways to overcome the deficiencies identified: each data domain should have its own domain-specific modeling language; Specialist Continuing choose his system of concepts and rules necessary to create models of ABM enabling professionals to build a modeling language with minimal system concepts that are semantically orthogonal; the user himself is building the graphical or textual notation, select the necessary methods and structure of the modeling process.

The information technology of object-oriented mathematical modeling, which provides an introduction to the modeling language UML structured goal models, sets, mathematical operations and combining grammars domain-specific languages with new grammars for Turing programming languages.

These materials provide an opportunity to use the proposed information technology domain-specific mathematical modeling of the process of developing specific subject areas of modeling languages.

Keywords: advantages, disadvantages, ways to overcome the disadvantages of modeling languages, mathematical modeling, information technology, simulation technology domains.

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DEVELOPMENT OF AN EDUCATIONAL-METHODICAL RESOURCE EDITOR USING WEB 2.0 TECHNOLOGIES (p. 10-17)

Olga Garbich-Moshora

Web 2.0 technologies, which correspond to the current development level of information and communication technologies and can be efficiently used in the educational activities, thereby contributing to the professional competence development and professional level improvement were reviewed and analyzed, the main benefits of the Web 2.0 technology are highlighted in the paper.

Provisions on the organization of the educational process at the Drohobych Ivan Franko State Pedagogical University and syllabus are analyzed and examined. Based on this, it was concluded that much time is spent on drawing up syllabuses that must be reviewed, signed by heads of departments, deans. In this regard, the task of creating an educational-methodical resource editor that facilitates the work of teachers, saving time for filling because conventional program fields are already prescribed, checking, correction of errors is relevant. Since this editor can be placed on the Internet, the program can be filled or checked at any time regardless of the location at the moment.

In developing the educational-methodical resource editor by WEB2.0 technologies:

– markup languages HTML, which uses hyperlinks for links and transitions from the current web page to other documents and CSS, which allows to divide the contents of the page depending on the type of document;

– programming languages PHP since it provides the vast majority of hosts, is characterized by easy mastering and high speed the development of new programs and JavaScript – well suited for the implementation of interactive Ajax-based web systems and supported by all modern popular browsers;

– structured query language SQL since it is characterized by high speed of operation and data processing, optimum reliability,

supported by an unlimited number of users, simultaneously working with the database;

– technology AJAX, in which formats JSON and XML are used for data transmission were used.

Keywords: global networks, information and communication technologies, syllabus, Web 2.0, information environment.

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DEVELOPMENT OF THE INFORMATION SUBSYSTEM FOR MONITORING POLLUTION OF NATURAL HEALING RESOURCES CAUSED BY ROAD TRANSPORT (p. 18-23)

Vladimir Mescheriakov, Anna Gnatovskaya, Katerina Cherepanova, Vitalij Fomenko

Natural healing resources (mud, mineral water, etc.) are affected by man-made pollution, such as road transport, therefore, require monitoring of their condition and taking protective measures to mitigate these impacts. Implementation of the task is impossible without creating an information system for monitoring and subsequent analysis of the impact of polluting factors on changes in biochemical composition of healing resources. Concerning necessary functions, this information tool should provide storage of information about the biochemical properties of natural healing resources, identify the composition and concentrations of pollutants from a particular source, reveal the pattern of pollutants distribution in the atmosphere.

Based on the analysis, it is shown that the function of the storage of data about characteristics of natural healing resources with reference to the map is advisable to implement in the form of cadastre, built using web-technologies, with the ability to work both in local and on-line modes. This reduces the subsystem cost and allows

operation both in stationary and field conditions using standard methods. As a subsystem of motor vehicle pollutant transformation in composition and concentration of impurities in the atmosphere, European calculation method COPERT 4 and software based on it was used, which has allowed to agree the parameters of pollutants with international standards and compare results. Subsystem for modeling the pollutants distribution in the atmosphere and its software implementation, based on a bimodal Gaussian model, which takes into account the pollution source reflection from the surface, resulting in a so-called "mirror" pollution source, as well as wind vector was developed. The correctness of the model is confirmed by external experimental studies that allows to predict the impurities distribution on the area of natural healing resources distribution, depending on weather conditions.

Keywords: monitoring, pollution, cadastre, natural healing resources, information system, database, analysis.

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FRACTAL IMAGE COMPRESSION METHOD
(p. 23-28)

Roman Zubko

The fractal image compression method is investigated. Among various coding methods, it allows to get the highest compression ratios. The mathematical model is considered, and classical algorithm of image coding-decoding using the fractal method is presented. Its essence lies in searching self-similar image parts based on compression parameters. Since the coding process using this method requires significant computational cost, its speed is low. It should be noted that image decoding does not need large capacity and resources of the operating system. Low compression speed is caused by the fact that high quality of the output image requires handling a large number of domain areas. So, studies on searching criteria that allow to select a suitable domain area that after affine transformations most closely approximates the rank region are relevant.

A brief analysis of methods for optimizing and improving the speed of building iterated function systems of fractal image coding, their efficiency and practical application possibility is performed.

Keywords: image compression, fractal algorithm, iterated function systems, affine transformations.

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SYSTEMS ENGINEERING OF OPTIMAL CONTROL SYNTHESIS OF THE STRUCTURE OF THE TECHNOLOGICAL PRODUCTS CONVERSION SYSTEM (Part 1) (p. 29-37)

Igor Lutsenko

Study of current controlled systems and scientific publications has shown that the architecture of controlled systems, related to the products conversion is based on the principle of austerity and, in general, does not provide the possibility of implementing a full parametric optimization.

The paper proposes to develop a controlled conversion system from highly specialized systems, each of which performs only one function. The conversion system has the ability of independent conversion process rate control, and finished products are transferred to the buffering system, which provides release of finished products with specified consumer properties and in the required volume to the consumption system. Herewith, the maximum number of degrees of freedom, which is a prerequisite for the implementation of the full parametric optimization is ensured.

The product conversion system structure was synthesized based on the liquid portion heating system is synthesized. The system is presented in the form of interconnected simple mechanisms.

It is experimentally found that systems with continuous feed – release of raw product are a special case of fully controllable systems with the architecture that provides the optimal control possibility.

The developed models were tested and examined in specially designed free software constructor EFFLI. Link to the current model of the controlled system is available in the text.

Keywords: system synthesis, controlled systems, conversion system, buffering system, system structure.

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BREWING UNIT TIME SERIES ANALYSIS IN THE RESEARCH OF THE COMPLEX SYSTEM ATTRACTOR PROPERTIES (p. 38-42)

Nick Chernetski, Vasil Kishenko

We have studied time series of a grout technology in making beer wort on the basis of grout temperature time series, using non-linear dynamics methods. We have developed algorithms for studying complex dynamic management systems as well as reconstructed attractors due to historical data on a brewing unit operation. Ultimately, we have estimated the Hurst index, the fractal volume, the delay time, the maximum phase space, and the correlation format. Our analysis of the indices has determined that the technological process of making beer wort has a complex non-linear behavior. This requires adequate methods and systems of synergetic management, which

would be compatible with the physical nature of the object. This approach allows using natural mechanisms of the beer wort technology at full capacity, which saves energy and expenses.

Keywords: determined chaos, phase space, correlation format, brewery, time series.

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IDENTIFICATION OF TARGET SYSTEM OPERATIONS. DETERMINATION OF THE TIME OF THE ACTUAL COMPLETION OF THE TARGET OPERATION (p. 42-47)

Igor Lutsenko

It was found in the paper that the time frames of the studied system operation depend on the research objective. In cases when it comes to problems, related to the physical movement of the input and output products, limits of the study are defined by the time of the beginning of the movement of the first input product of the operation and ends with the time of issue of the last output product of the operation by the system.

Time of completion of the physical movement of products is defined in the paper as the time of the physical completion of the operation.

Since the purpose of any operation is to increase the value of the output products in relation to the value of input products of the operation, in cases when there is a problem of investigating the target operation, the time of completion of the target operation is determined not by the physics of the process, but its cybernetics.

Since for the time of the operation, conversion processes link input products in time, the added value of output products is intended to compensate in time the costs of temporary binding of input products that initially have their value.

The time, when the added value of output products of the target operation compensates the value of tight input products for the time of the operation, is defined in the paper as the time of the actual completion of the target operation.

A system of notations to describe the system processes of target operations was proposed.

The expressions for the numerical and analytical determination of the time of actual completion of the target operation were obtained. A link to the resource, with examples of calculations of the time of the actual completion of the operation with the use of numerical methods and analytic expressions, obtained in the paper was given.

Keywords: operations research, model of target operation, time of actual completion of target operation.

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COMPUTER ENERGY-SAVING TECHNOLOGIES FOR BUILDING LIFE-SUPPORT SYSTEMS CONTROL (p. 48-53)

Anatolii Bobukh, Dmytro Kovalyov, Andrii Klimov, Alexandr Dzevochko

Energy saving in building life-support systems is a complex problem of global concern. As a result of the studies, functional diagrams of computer-integrated control systems for technological processes of traditional (upgrading of existing) and alternative (development of new) heating systems are developed. Developed functional schemes allow to improve the operating efficiency of building life-support systems and save the material and energy resources in conditions of scarcity for:

• modernized individual heat point with heating and hot water treatment systems of the building through the energy-saving efficiency improvement, air temperature control in each room individually, heat energy consumption accounting for each apartment that encourages timely payment by tenants;

• solar collector systems through the air temperature control in each room individually, including in very hot summer (air conditioning), energy saving;

• systems for obtaining and using geothermal energy for four heat transfer cycles through creating favorable conditions in premises (especially office premises), energy saving.

Saving material and energy resources through applying computer energy-saving technologies for building life-support systems control promotes solving an urgent problem of global scale - energy saving.

Keywords: energy saving, building life-support systems, alternative heating, computer-integrated control systems.

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THEORETICAL ASPECTS OF MODELING FUZZY CONTROLLER FOR MANAGEMENT SYSTEM OF ELECTRIC ENERGY CONSUMPTION BY AIRPORTS (p. 54-60)

Oleg Leschinskij, Dmitrij Bugayko, Nataliya Sokolova

The paper deals with the use of the management models of effective electric energy consumption by airports with fuzzy controller. The implementation variants of fuzzy controllers are considered. According to the fuzzy control analysis, based on existing fuzzy controllers, appropriate models and expressions of transfer functions are proposed. Studies show that fuzzy models are universal approximators for systems that are modeled, i.e. they can be used to obtain approximate representations of systems with arbitrary preset accuracy. Use of this controller will allow to improve the quality of the modeling system of energy efficiency of airlines, which is extremely important in economic crisis conditions and is of practical importance for improving the economic security of the airport. Permanent monitoring of electric energy consumption by airports taking into account features of equipment and operation modes of facilities will allow to get practical recommendations on high-quality management of electric energy consumption efficiency in order to improve energy security.

Keywords: modeling, management, fuzzy controller, system, electric energy, airport.

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DEVELOPMENT OF THE BLOCK DIAGRAM OF AIRCRAFT CONTROL SYSTEM IN CASE OF AN EMERGENCY (p. 61-66)

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The main causes of an in-flight emergency were analyzed. Statistics of air accidents, caused by bird strikes were examined, an increase in such air accidents was noted. The formulas of the aerodynamic coefficients, which included emergency coefficients were developed. These formulas are systems of differential equations of the aircraft longitudinal and lateral movement, which include coefficients that describe the impact of an emergency on the aircraft aerodynamic properties. Equations of the aircraft motion dynamics taking into account the impact of an emergency were also formulated. The development of these equations is needed to create an aircraft control system in case of an emergency and work out a stabilizing effect. Block diagram of the aircraft flight control reconfiguration system in case of an emergency was elaborated. Designing the flight control reconfiguration system will allow to prevent emergency development and follow the intended flight path. As a result of the study, the basic causes of the failures that lead to emergencies, including lightning strike damage, bird strike damage, drive power loss or sensor failures were revealed. Neces-

sary characteristics, determination of which allows to use model predictive control were also singled out. These characteristics are forecast horizon length, constraints on the control signal, sampling increment. Using the reconfiguration system will allow to reduce the accident risk, improve the aircraft sustainability and controllability, increase overall flight safety.

Keywords: emergency, control system, reconfiguration, control surfaces, mathematical model, damage.

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